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(54) Coil termination for a radiant heater

(57) A heating unit (40) for use with a glass/ceramic type cooking top includes an electrical resistance-type heating element(11) which generates heat radiated at an area of the cooking top when a current is supplied to the heating unit. An improvement comprises a control unit (44) to which current is routed and to which respective ends (50a, 50b) of the heating element (11) are electrically connected. This allows current to be directed to the heating element (11) through the control unit (44). The decontrol unit (44) has a pair of terminals (48a, 48b) to which each end of the heating element (11) is attached. A ceramic sleeve (52a, 52b) fits over the respective ends of the heating element (11) and provides a thermal insulation between the heating element (11) and the control unit (44) to control heat loss of the heating unit (40). Weld tabs (56) are used to attach the respective ends of the heating element (11) to the control unit (44) to electrically connect the heating element (11) to control unit (44). Current flow through the control unit (44) is now routed through the heating element (11). The weld tabs are used with a resistance welding process to attach the ends of the heating element (11) to the terminals (48a, 48b). Or, if an ultrasonic welding process is used, no tabs are required for attaching the ends of the heating element to the terminals.

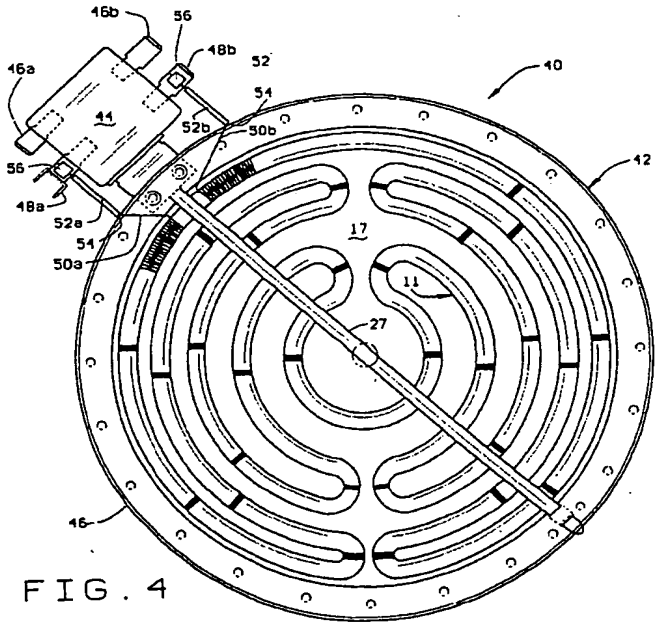

FIG. 4

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Description

BACKGROUND OF THE INVENTION

This invention relates to radiant heating units for use with glasstop stove tops and, more particularly, to an improved coil termination for use on such units.

Glasstop stoves are well-known in the art. See, for example, United States Patent 5,220,155 which is assigned to the same assignee as the present invention and which is incorporated herein by reference. A heating unit for use with such a stove top has a heating coil installed in a pan which is mounted beneath the stove stop. The coil is comprised of a resistance wire which radiates heat when a current is supplied to the element. The ends of the coil are terminated in a unit which, in turn, is connected to a temperature or cooking control of the stove. Usually, the control is a knob which the user turns to a position representing some level of heat the heating unit needs to produce to cook food placed on the stove top. Conventional heating units comprise a terminal block located on a sidewall of the heating unit. A plurality of electrical terminals are installed in the block. Two of the terminals are soldered or crimped onto the respective ends of the coil. Other of the terminals are connected to a control unit through which current is routed from the control knobs to the coils. This control unit includes a temperature responsive switch for cutting off current flow if the temperature of the heating unit exceeds a predetermined level.

Heretofore, installation of the control unit and connection of the unit to the terminal block, as well connection of the heating coil ends to the terminal block, has required an extensive number of components and interconnections. As such, the process has meant added cost of the unit. It is possible to make the appropriate installation requiring fewer components and interconnections so to reduce unit costs.

SUMMARY OF THE INVENTION

Among the several objects of the present invention may be noted the provision of an improved radiant heating unit for use in a stove or range, the heating unit being mounted beneath a cooking top of the range to heat a defined cooking area thereof; the provision of such an improved heating unit requiring fewer components than prior heating unit constructions; the provisions of such an improved heating unit requiring fewer steps to assemble thereby reducing manufacturing costs; the provision of such an improved heating unit which reduces losses due to heat during operation of the unit thereby making it more efficient than prior heating units; the provisions of such an improved heating unit in which a resistance wire, coil wound heating element is readily and simply attached to a control unit for the heating unit; the provision of such an improved heating unit to attach the ends of a resistance heating wire directly to a control unit using either a resistance welding or ultrasonic welding technique; the provision of such an improved heating unit which is readily installed and which operates in the same manner as prior heating units; the provision of such an improved heating unit to be easily replaceable so to reduce repair and replacement costs; and, the provision of such an improved heating unit which can be used as original equipment on new stoves, or as a replacement part on existing stoves.

In accordance with the invention, generally stated, a heating unit for use with a glass/ceramic type cooking top includes a resistance-type heating element which generates heat radiated at a surface of the cooking top when a current is supplied to the heating unit. Electrical current is routed to a control unit and respective ends of the heating element are electrically connected to the control unit for the current to be routed to the heating element through the control unit. The control unit includes a pair of terminals to which respective ends of the heating element are attached. A ceramic sleeve is fitted over the respective ends of the heating element. The sleeves provide a thermal insulation between the heating element and the control unit. Weld tabs are used to attach the respective ends of the heating element to the control unit to electrically connect the heating element and the control unit. Now, current flow through the control unit is also routed through the heating element. The weld tabs are used if the heater element ends are attached to the terminals by resistance welding. If the ends are ultrasonically welded to the terminals, the tabs are not used. A method of making a heating unit is also disclosed. Other objects and features will be in part apparent and in part pointed out hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a top plan view of a range;

Fig. 2 is a side elevational view of the range top with radiant heating units installed;

Fig. 3 illustrates a prior art heating unit assembly; and,

Fig. 4 illustrates a heating unit construction of the present invention.

Corresponding reference characters indicate corresponding parts throughout the drawings.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the drawings, a stove or range 1 has a glass/ceramic cooking top 3. As is well known in the art, the cook top has a number of defined areas 5 on which cooking utensils are placed for heating food. A control panel 7 conveniently placed for the user of the stove has separate control knobs 9 or the like for separately controlling the temperature to which each area 5 is heated. The areas are heated by coils 11 of electrical resistance wire. The coils are mounted in pans 13 that are located

on the underside of the cooking top. When a current is supplied to the wire, the resulting heat which is generated is radiated onto the underside of top 3 to elevate the surface temperature of the defined areas. The pans typically include a liner 17 of an insulation material and the coils 11 are placed on this liner. As shown in Fig. 3, the coils are arranged in a particular pattern to increase the efficiency of the heating.

In assembling a pan 13, a control unit 19 is attached to a sidewall 21 of the pan. The control unit has electrical terminals 23a, 23b which are electronically connected to one of the temperature control knobs 9. The control unit has additional terminals 25a, 25b for connecting the control unit to respective ends of the heating wire. A temperature sensor rod 27 extends diagonally across the pan above the wire. The rod is connected to a switch within the control unit. If the temperature sensed by the rod exceeds a predetermined temperature, the switch acts to open the circuit path to the wire interrupting current flow through the wire. A multi-pin terminal block 29 is mounted to the sidewall 27 of pan 13 to one side of the location of the control unit. A retainer 31 is used to hold the block in place. In Fig. 3, block 29 is shown to accommodate four terminals 33. A bus bar 35 is used to short three of the terminals together. One end of wire 11 is attached to one of the terminals 33, and the other end of the wire is attached to one of the three commonly connected terminals. A pair of jumper wires 37 having appropriate connectors at each end are used to bridge the terminals 25a, 25b of the control unit which the appropriate terminals 33 on block 29, to complete the electrical circuit between the control unit and heating wire.

There are a number of drawbacks with this current heating unit construction. First of all it involves a substantial number of parts. This adds cost to the unit. And, second, the installation of the various components and their attachment to each other adds time and cost to the assembly process of the heating unit.

Apparatus 40 of the present invention comprises an improved heating unit as shown in Fig. 4. Unit 40 includes a pan 42 which is similar to pan 13 and is also positioned adjacent an area 5 of the cook top 3 to be heated. A liner 17 of an insulation material is installed in the pan; and, a coiled wire, resistance type heating element 11 is placed on top of the liner in the same manner previously described. As with the previously described heating unit, heat generated by passing a current through the wire is radiated at the surface to be heated. A control unit 44 is mounted to a side 46 of the pan. The control unit includes a first set of terminals 46a, 46b by which the heater assembly is electrically connected to knob 9; and a second set of terminals 48a, 48b for connecting the ends of wire 11 to the control unit. As before, the control unit has a sensor rod 27 and an internal cut-off switch for disrupting current flow to the heating element if an over-temperature condition occurs.

Now, unlike the previously described heater assembly, ends 50a, 50b of wire 11 are directly connected to the respective control unit terminals. This eliminates a number of components previously required. It also reduces assembly time. Both of these factors serve to greatly reduce the cost of a heater assembly. Heating unit 42 includes a sleeve means 52 fitting over the respective ends 50a, 50b of wire 11 to provide a thermal insulation between the resistance wire and the control unit. When the heating wire is installed on the insulation, the ends 50a, 50b are made long enough to extend from the coiled portion of the wire to openings 54 in the sidewall of the pan and from the side of the pan to the terminals. Sleeve means 52 includes ceramic sleeves 52a, 52b fitting over the lengths of wire extending between the sidewall of the pan and the respective terminals 48a, 48b. The sleeves provide a thermal insulation which reduces the heat loss of the wire to increase the efficiency of the heating unit. The outer end of the wires extend beyond the outer end of the respective sleeves and rest upon their associated control unit terminal. Now, the ends of the heater wire can be directly welded to the terminals by ultrasonic welding. Or, a tab means 56 includes tabs which can be placed over the end of the wire resting upon a terminal. The tabs 56 are weld tabs and are used to facilitate resistance welding of the wire ends to their respective terminals.

What has been described is an improved radiant heating unit for use with stoves or ranges with a glasstop cooking surface. The heating unit is readily mounted beneath a cooking top to heat a defined area to a desired cooking temperature. The unit requires substantially fewer components than prior heating unit constructions; and, fewer steps are required to assemble the unit. These factors significantly reduce the manufacturing cost of the unit. During operation, heat losses are reduced thereby making the unit more efficient than prior heating units. The heating unit includes a resistor wire, coil wound heating element which is simply and easily attached to a control unit for the heating unit. The heating unit, when installed beneath the cook top, operates in the same manner as prior heating units. The heating unit is easily replaced so to reduce repair and replacement costs; and, the heating unit can be used either as original equipment on new stoves, or as a replacement part on existing stoves.

In view of the foregoing, it will be seen that the several objects of the invention are achieved and other advantageous results are obtained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Claims

1. In a heating unit for use with a glass/ceramic type cooking top, the heating unit including a resistance-type heating element which generates heat which is radiated at a surface of the cooking top when a current is supplied to the heating unit, the improvement comprising:

   a control unit to which the current is routed and to which respective ends of the heating element are electrically connected for the current to be routed to the heating element through the control unit, the control unit including a pair of terminals to which respective ends of the heating element are attached; and,
   sleeve means fitting over the respective ends of the heating element, the sleeve means providing a thermal insulation between the heating element and the control unit.

2. The improvement of claim 1 further including tab means for attaching the respective ends of the heating element to the control unit to electrically connect the heating element to the control unit for current flow through the control unit to be routed through the heating element.

3. The improvement of claim 1 wherein the heating element is installed in a pan to the side of which the control unit is attached and the heating element is a coiled wire heating element the respective ends of which extend from a side of the pan to the terminals to which they are attached.

4. The improvement of claim 3 wherein the sleeve means includes a ceramic sleeve which fits over the length of wire extending between the side of the pan and the terminal to which it is attached, the ends of the wire being attached to the terminals by ultrasonic welding.

5. The improvement of claim 2 wherein the tab means include weld tabs which fit over the respective end of the wire which is to be attached to a terminal, the weld tab being welded to the terminal to attach an end of the heater element wire thereto.

6. The improvement of claim 5 wherein the weld tabs are resistance weld tabs for the ends of the wire to be resistance welded to the terminals using the tabs.

7. Heating apparatus for heating a defined area of a glass/ceramic type cooking surface comprising:

   a pan positioned adjacent the area of the surface to be heated;
   insulation means installed in the pan;
   a resistance-type heating element placed on the insulation means and generating heat which is radiated at the surface to be heated when a current is supplied to the heating unit;
   a control unit to which the current is routed and to which respective ends of the heating element are electrically connected for the current to be routed to the heating element through the control unit, the control unit including a pair of terminals to which respective ends of the heating element are attached;
   sleeve means fitting over the respective ends of the heating element, the sleeve means providing a thermal insulation between the heating element and the control unit; and
   tab means for attaching the respective ends of the heating element to the control unit to electrically connect the heating element to the control unit for current flow through the control unit to be routed through the heating element.

8. The apparatus of claim 7 wherein the control unit is attached to a side of the pan and the heating element is a coiled wire heating element the respective ends of which extend from a side of the pan to the terminals to which they are attached.

9. The apparatus of claim 8 therein the sleeve means includes a ceramic sleeve which fits over the length of wire extending between the side of the pan and the terminal to which it is attached.

10. The apparatus of claim 9 wherein the tab means include weld tabs which fit over the respective end of the wire which is to be attached to a terminal, the weld tab being welded to the terminal to attach an end of the heater element wire thereto.

11. The apparatus of claim 10 wherein the weld tabs are resistance weld tabs for the ends of the wire to be resistance welded to the terminals using the tabs.

12. A method of forming a heating unit for use with a glass/ceramic type cooking top comprising:

   placing a lining material in a pan supportable beneath the cooking surface;
   laying a resistance-type heating element on the lining material for the heating element to generate heat which is radiated at a surface of the cooking top when an electrical current is supplied to the heating unit;
   installing a control unit on the side of the pan, electrical current being routed through the control unit to the heating element;
   extending respective ends of the heating ele-

ment to respective electrical terminals extending from the control unit, including inserting the ends of the heating element through sleeve means fitting over the respective ends of the heating element, the sleeve means providing a thermal insulation between the heating element and the control unit; and,
placing tab means over exposed outer ends of the wire which are placed on the terminals and welding the tab means to the terminals to attach the wires thereto.

13. The method of claim 12 wherein inserting ends of the wire through a sleeve means includes inserting the ends through a ceramic sleeve which is sized to fit over the length of wire extending between the side of the pan and the terminal to which it is attached, but leaves the end of the wire on the terminal exposed.

14. The method of claim 13 wherein welding the tab means to attach an end of the wire to the terminal includes resistance welding the tab means.

15. A method of terminating the ends of a coiled wire resistance-type heating element to a control unit of an electrically operated, radiant heat heating unit used to radiate heat at a surface to be heated, electrical current routed to the wire being routed thereto through the control unit, the method comprising:

routing the respective ends of the wire to a pair of electrical terminals on the control unit for attachment of each end to one of the terminals, said routing including fitting sleeves over the respective ends of the wire to provide a thermal insulation between the wire and the control unit thereby to reduce heat losses of the heating unit; and,
ultrasonically welding the ends of the wire to the respective terminals to electrically connect the heating element wire to the control unit.

16. The method of claim 15 wherein the sleeves are ceramic, thermally insulative sleeves.

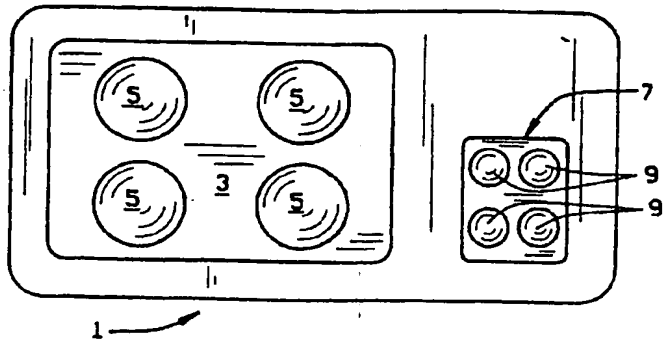

FIG. 1
PRIOR ART

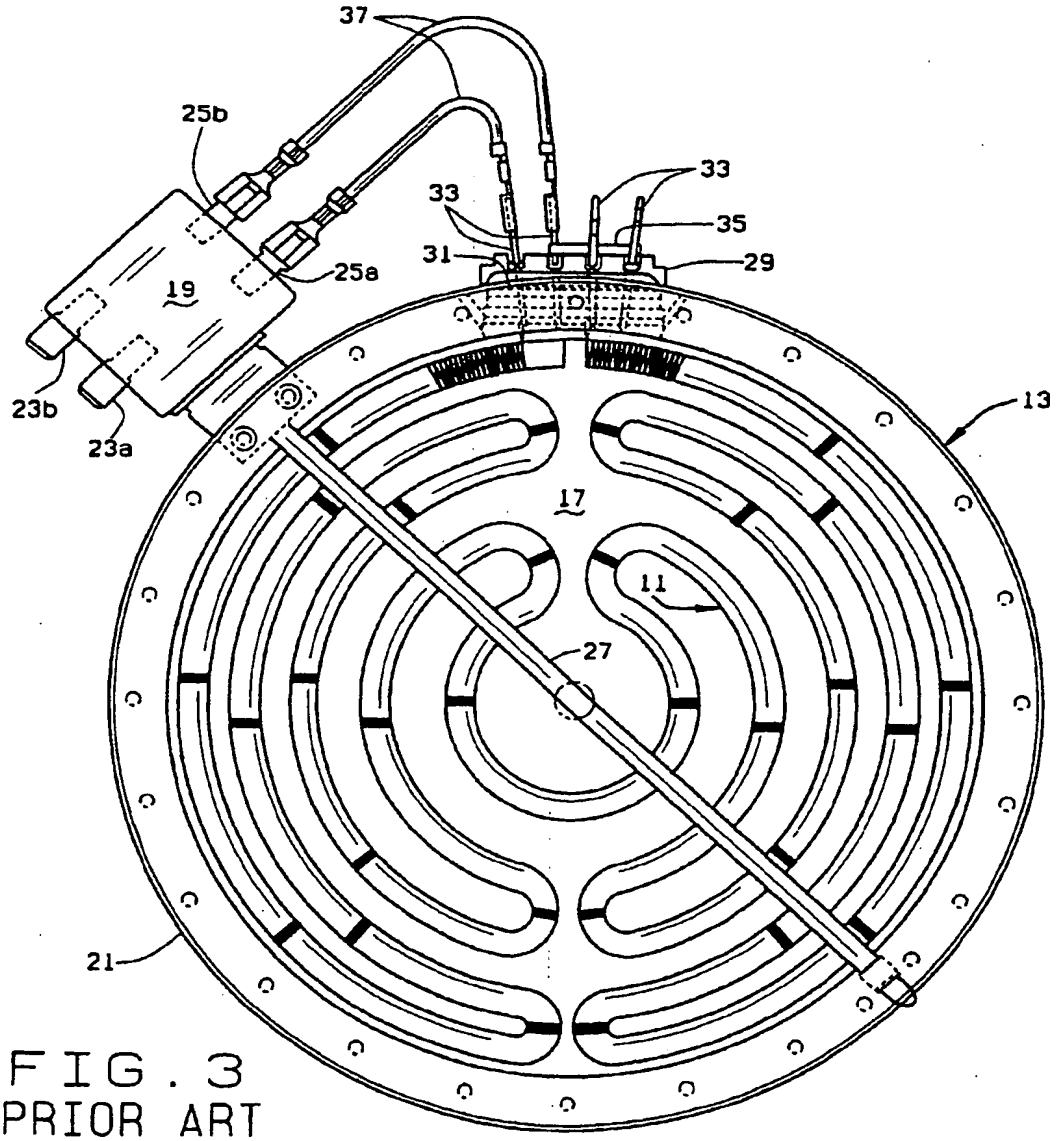

FIG. 3
PRIOR ART

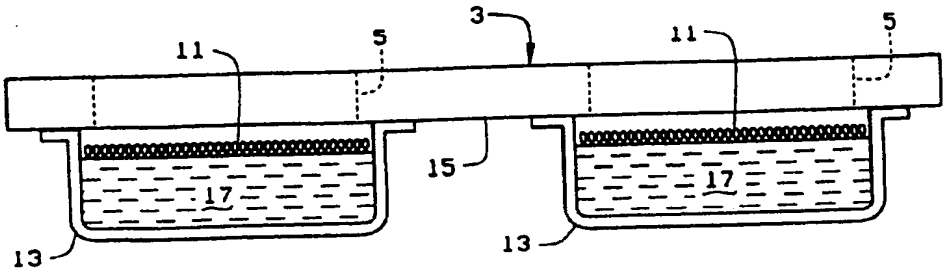

FIG. 2
PRIOR ART

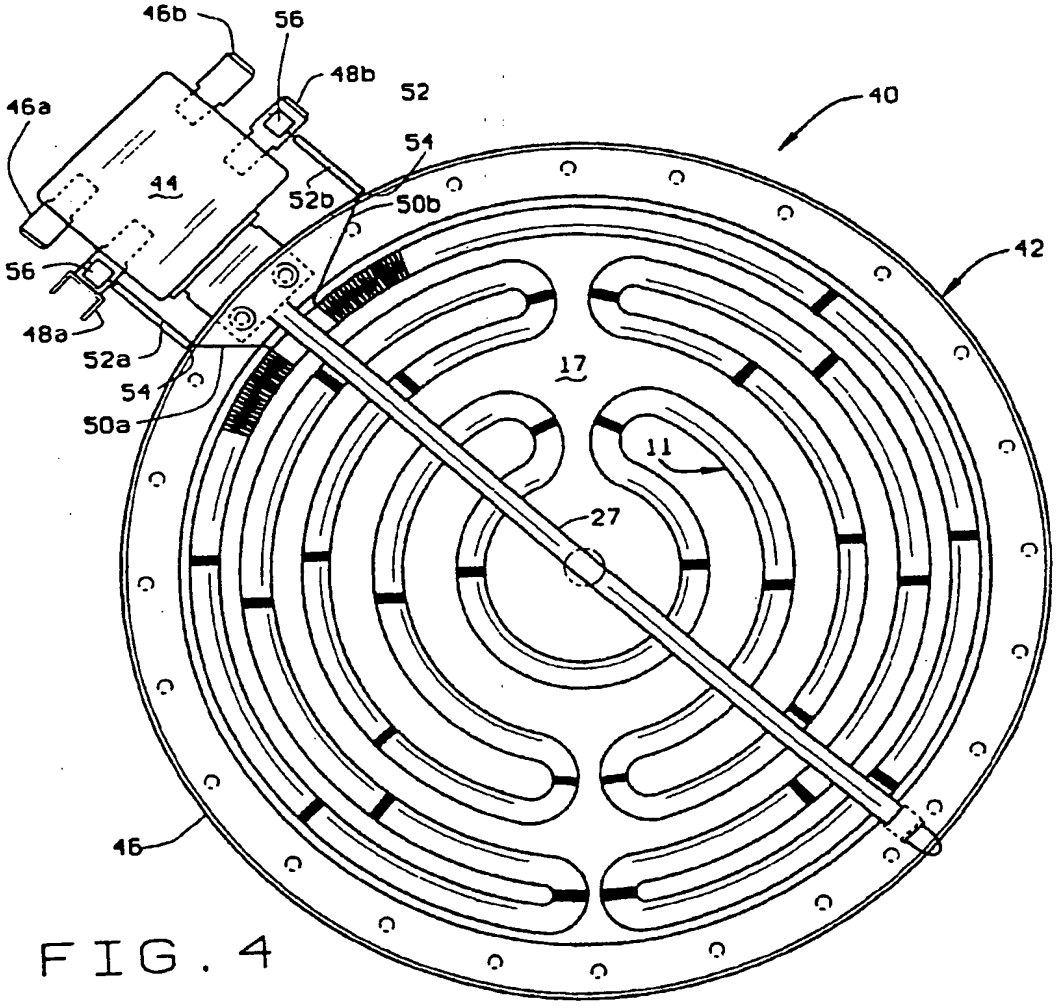

FIG. 4